UNITED STATES PATENT AND TRADEMARK OFFICE

A

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/767,196	01/30/2004	Hajime Sato	501.43402X00	5718

24956	7590	10/06/2005

MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C.
1800 DIAGONAL ROAD
SUITE 370
ALEXANDRIA, VA 22314

EXAMINER
ROJAS, MIDYS

ART UNIT	PAPER NUMBER
2185	

DATE MAILED: 10/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.	Applicant(s)
Office Action Summary	10/767,196	SATO ET AL.
	Examiner	Art Unit
	Midys Rojas	2189

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *16 March 2005*.

2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-20* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-20* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on *30 January 2004* is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☒ All b) ☐ Some * c) ☐ None of:

      1. ☒ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____.

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date *3/16/05, 1/30/04*.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

U.S. Patent and Trademark Office

PTOL-326 (Rev. 1-04)   Office Action Summary   Part of Paper No./Mail Date 09302005

DETAILED ACTION

Priority

1.   Acknowledgment is made of applicant's claim for foreign priority under 35

U.S.C. 119(a)-(d). The certified copy was received on July 20th, 2004.

Information Disclosure Statement

2.   The information disclosure statements (IDS) submitted on January 30th, 2004 and March

16th, 2005 have been considered by the examiner.

Drawings

3.   The drawings received on January 30th, 2004 have been accepted by the examiner.

Claim Objections

4.   Claims 1, 11, and 20 are objected to for containing intended used limitations ("capable of

communicating"). Applicant is advised that these limitations do not carry patentable weight

because in being capable of performing a function, the function is not necessarily being

performed.

Claim Rejections - 35 USC § 102

5.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6.   Claims 1-9, and 11-20 are rejected under 35 U.S.C. 102(b) as being anticipated by

Kedem (6,154,853).

Regarding Claim 1, Kedem discloses a disk array device (Figure 2), which can be connected to a host device (Hosts a-n) so that they are capable of communicating with each other, the disk array device comprising: a disk array control unit (disk controllers 26) which performs control of the entire disk array device; a host side data transfer control unit which controls data transfer to and from the host device (host controllers 22); a disk array including at least plural data disk drives which constitute one parity group and one or more spare disk drives (28a-28n, see Col. 2, lines 23-32), wherein the one parity group has a large number of data stripes which are formed over storage areas of the plural data disk drives and the large number of data stripes can be partitioned into two or more sets of the data stripes (Col. 1, lines 38-52); a cache memory which is used for temporary storage of data to be transferred between the host device and the disk array (Global Memory 24); and a subordinate side transfer control unit which controls data transfer to and from the disk array (disk controllers 26), wherein the disk array control unit comprises: a prediction section which predicts the likelihood of occurrence of a failure for each data disk drive (the storage system determines that device is beginning to experience too many errors, Col. 4, line 63 – Col. 5, line 3; and Col. 1, line 62 – Col. 2, line 10); and a divided data copy section which selects two or more data disk drives out of the plural data disk drives as objects of divided data copy according to the predicted likelihood of the occurrence of a failure, selects two or more divided storage areas by selecting one divided storage area from each of the selected two or more data disk drives, the selected two or more divided storage areas belonging to different sets of the data stripes in the parity group, and controls the subordinate side transfer control unit and the cache memory so as to copy data in the selected two or more divided storage areas to the one or more spare disk drives (failure

determination in the system when in default stripping parity mode, but prior to the occurrence of

dynamic sparing, see Col. 6, lines 15-35). In this system dynamic sparing occurs when too many

errors are detected (high likelihood of failure). If some errors are detected, but not too many

errors, it will continue using parity and stripping. In this instance, if failure occurs, parity and

stripping must be used for the recovery of the error.

Regarding Claim 2, Kedem discloses a disk array device wherein the disk array control

unit further comprises a dynamic sparing section (represented by the storage system since it

performs the dynamic sparing operation) which selects one data disk drive as an object of

dynamic sparing out of the plural data disk drives according to the predicted likelihood of

occurrence of a failure (too many errors detected are equivalent to a determination of a high

probability to failure), selects remaining divided storage areas, from which data has not been

copied by the divided data copy section, from the selected one data disk drive, and controls the

subordinate side transfer control units and the cache memory so as to copy data in the selected

remaining divided storage areas to the spare disk drives (see Col. 5, lines 1-35 for description of

dynamic sparing operations. Also see Col. 1, line 62 - Col. 2, line 10). In this system dynamic

sparing occurs when too many errors are detected (high likelihood of failure). If some errors are

detected, but not too many errors, it will continue using parity and stripping. In the instance

where dynamic sparing is used, if failure occurs, the spare disks will be used for recovery.

Regarding Claim 3, Kedem disclose a disk array device wherein, in the case in which the

predicted likelihood of occurrence of a failure of a first data disk drive in the plural data disk

drives has reached a first level (If some errors occur, but not too many, low likelihood of failure),

the divided data copy section selects at least the first data disk drive and a separate second data

disk drive as objects of the divided data copy (failure determination in the system when in default stripping parity mode, but prior to the occurrence of dynamic sparing, see Col. 6, lines 15-35), and in the case in which the predicted likelihood of occurrence of a failure of the first data disk drive has reached a second level which is higher than the first level (too many errors detected, high likelihood of failure), the dynamic sparing section selects the first data disk drive as an object of the dynamic sparing (see Col. 5, lines 1-35 for description of dynamic sparing operations. Also see Col. 1, line 62 - Col. 2, line 10).

Regarding Claim 4, Kedem discloses a disk array device wherein, in the case in which the predicted likelihood of occurrence of a failure of the first disk drive among the plural disk drives has reached a predetermined level, the divided data copy section selects the first data disk drive and a second data disk drive, which has the largest predicted likelihood of occurrence of a failure after the first data disk drive, as objects of the divided data copy (see Col. 6, lines 15-35 for divided data copy operation).

Regarding Claim 5, Kedem discloses a disk array device wherein the divided data copy section controls the subordinate side transfer control unit and the cache memory so as to read out data simultaneously from the selected two or more divided storage areas in a course of copying the data in the selected two or more divided storage areas (see Col. 6, lines 15-35 for divided data copy operation). See also Col. 3 lines 15-55 for functionality of global memory 24.

Regarding Claim 6, Kedem discloses a disk array device, wherein the disk array control unit further comprises a spare data updating section which, in the case in which a new request for writing data in the selected two or more divided storage areas from the host device is received from the host side data transfer unit after the data in the selected two or more divided storage

areas is started to be copied to the one or more spare disk drives, controls the subordinate side transfer control unit and the cache memory so as to write the new data received from the host device in the selected two or more divided storage areas and write the data in the spare disk drives as well (see Col. 6, lines 15-35 for divided data copy operation and Col. 4, lines 63-Col. 5, lines 35 for dynamic sparing operation). After the divided data copy operation is complete (or even in the case of dynamic sparing), the system will be reconfigured to a mirror configuration, therefore, new data must be written in the divided storage areas (stripes) as well as in the spare devices, thus maintaining the mirror configuration.

Regarding Claim 7, Kedem discloses a disk array device wherein the divided data copy section selects first and second data disk drives as objects of the divided data copy from the plural data disk drives, selects a first divided storage area belonging to a set of front side data stripes in the parity groups from the first data disk drive, selects a second divided storage area belonging to a set of rear side data stripes following the set of front side data stripes from the second data disk drive, and controls the subordinate side transfer control unit and the cache memory so as to copy data in the first and the second divided storage areas to the spare disk drives (see Col. 6, lines 15-35 for divided data copy operation).

Regarding Claim 8, Kedem discloses a disk array device, wherein the two or more divided storage areas selected from the two or more data disk drives by the divided data copy section have substantially the same size (Col. 6, lines 15-35). In this system the divided storage areas selected for copying during a failure are disks within a disk array where in RAID disks arrays do not have to be of the same size, yet the stripes within the disks of the array must be of the same size.

Regarding Claim 9, Kedem discloses a disk array device wherein the two or more divided storage areas selected from the two or more data disk drives by the divided data copy section have different sizes according to the predicted likelihood of occurrence of a failure of the two or more data disk drives (Col. 6, lines 15-35). In this system the divided storage areas selected for copying during a failure are disks within a disk array where in RAID disks arrays do not have to be of the same size, yet the stripes within the disks of the array must be of the same size.

Claim 11 is rejected using the same rationale as that of Claim 1 wherein the method is performed by the disk array of Kedem.

Claim 12 is rejected using the same rationale as that of Claim 2.

Claim 13 is rejected using the same rationale as that of Claim 3.

Claim 14 is rejected using the same rationale as that of Claim 4.

Claim 15 is rejected using the same rationale as that of Claim 5.

Claim 16 is rejected using the same rationale as that of Claim 6.

Claim 17 is rejected using the same rationale as that of Claim 7.

Claim 18 is rejected using the same rationale as that of Claim 8.

Claim 19 is rejected using the same rationale as that of Claim 9.

Claim 20 is rejected using the same rationale as that of Claims 1 and 11.

Claim Rejections - 35 USC § 103

7.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8.   Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kedem

(6,154,853) in view of Kodama (2001/0012442).

Regarding Claim 10, Kedem discloses the invention as set forth by Claim 1 above.

Kedem also discloses keeping track of the errors of the disk array (Col. 5, lines 1-3) and predicts

a failure on the basis of the error being tracked. Kedem does not teach storing an error

occurrence history for each of the data disk drives. Kodama discloses an error table indicative of

RAID errors (error occurrence history). It would have been obvious to one of ordinary skill in

the art at the time the invention was made to modify the system of Kedem to include an error

table since it already tracks the errors of the disk drives and in tracking these errors, there must

be a record of occurrence in order to determine when too many errors have occurred.

Conclusion

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Midys Rojas whose telephone number is (571) 272-4207. The

examiner can normally be reached on M-F 5:30am - 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Mano Padmanabhan can be reached on (571) 272-4210. The fax phone number for

the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Midys Rojas
Examiner
Art Unit 2189

MR

MANO PADMANABHAN
SUPERVISORY PATENT EXAMINER